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ABSTRACT

A study examined whether previous knowledge facilitates the acquisition of a reading comprehension strategy by children who are poor readers. Subjects, 54 fourth- and fifth-grade boys in Palm Beach County, Florida, who were poor readers and baseball experts, were trained in the use of a reading strategy (asking "why" questions), with instruction being embedded in baseball (T-BB) or nonbaseball (T-NB; about less familiar sports) stories. The boys were tested 1 to 3 days after training, then again 2 to 3 weeks after the training. Boys in the T-BB group demonstrated greater strategy use at both posttests, indicating that knowledge base aided in the acquisition of a reading comprehension strategy. More "why" questions were asked by the T-BB group for the less familiar nonbaseball stories, an indication of appropriate monitoring. Children with higher declarative metamemory scores demonstrated better strategy acquisition and recall (both free and cued recall) than did boys with lower metamemory scores. (Three tables and four figures of data are included.) (Author/RS)

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THE ROLE OF KNOWLEDGE BASE AND DECLARATIVE METAMEMORY IN THE ACQUISITION OF A READING STRATEGY

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ABSTRACT

Fourth- and fifth-grade boys who were poor readers and baseball experts were trained in the use of a reading strategy (asking "why" questions), with instruction being embedded in baseball (T-BB) or nonbaseball (T-NB; about less familiar sports) stories. The boys were tested 1-3 days after training, then again 2-3 weeks after training. Boys in the T-BB group demonstrated greater strategy use at both posttests, indicating that knowledge base aided in the acquisition of a reading comprehension strategy. More "why" questions were asked by the T-BB group for the less familiar nonbaseball stories, an indication of appropriate monitoring. Children with higher declarative metamemory scores demonstrated better strategy acquisition and recall (both free and cued recall) than did boys with lower metamemory scores.

INTRODUCTION

The purpose of the current experiment was to examine whether previous knowledge facilitates the acquisition of a reading comprehension strategy by children who are poor readers. Prior metamemory is also a possible moderating factor in strategy acquisition, and was therefore included in this study.

Previous knowledge may impact strategy use by facilitating the use of a strategy or the generalization of a strategy to a new domain (Chi, 1985; Schneider, Korkel, & Weinert, 1990). Bjorklund takes this one step further by suggesting that previous knowledge can aid in the acquisition of a new strategy (Bjorklund & Buchanan, 1989).

Studies examining the relationships between prior knowledge and recall often use the expert/novice paradigm, assuming that one who is expert in a topic has more elaborated schemas for that topic. It is obvious from this perspective that any facilitative effects of knowledge on memory must be assumed to be domain specific.

It is clear that the facilitative effect of knowledge on reading recall and understanding is not limited to those of higher abilities (Recht & Leslie, 1988; Schneider, Korkel, & Weinert, 1989; Schneider, Korkel, & Weinert, 1990; Walker, 1987). In the Recht and Leslie and Walker studies, individuals of lower abilities showed the benefit of prior knowledge on text comprehension. In the Schneider et al. (1990) study, poor learners/soccer expert children performed as well as the good learners/soccer experts and better than good learner/soccer novices on measures of text recall and understanding. Expertise actually overcame previous learning ability.

The present study examined whether a reading comprehension

strategy might be more readily acquired when taught to poor readers in an area of expertise as opposed to an equally interesting but unfamiliar domain. Prior knowledge of baseball served as the area of expertise. Boys who were poor readers and who were baseball experts (i.e., who scored above a criterion on a test of baseball knowledge) served as subjects.

Prior baseball and metacognitive knowledge were assessed, and use of a target strategy was considered at three points during the study (pretest, near, and distant posttests). Children in the training conditions received two days of strategy instruction, while children in the control conditions read the same stories as the children in the training conditions without benefit of specific instruction. Training took place using either baseball (within area of expertise) or nonbaseball (out of area of expertise) sports stories.

HYPOTHESES

- All children who read baseball stories were expected to show greater recall than those who read nonbaseball stories, due to the effects of prior knowledge.
- Children in the training conditions were likewise expected to show greater strategy use and recall.
- Baseball experts in the training condition reading baseball stories should demonstrate greater acquisition and retention of the strategy than children in the other three conditions.
- Baseball experts reading baseball stories were expected to be more accurate in their monitoring.
- Children with higher declarative metamemory knowledge about reading would demonstrate greater acquisition of the reading strategy, and possibly greater recall.

METHOD

Subjects

Out of a starting pool of 166 boys who had been identified as poor readers by their schools, 54 fourth- and fifth-grade boys from Palm Beach County, Florida schools were included. The children had an IQ estimate within a normal range, were reading about a year below grade level, yet had not been identified as learning disabled.

Materials

The pretest of baseball knowledge was an adaptation of one used by Recht and Leslie (1988) in their study examining junior high baseball experts and novices. An example of the items used is displayed.

The reading metamemory test, the Index of Reading Awareness, was developed by Jacobs and Paris (1987). Examples are attached.

The stories used in the testing and training phases of this study were adapted from a commercially prepared kit featuring short passages on famous sports stars (Media Materials, 1990). The stories were reworded to disguise the true identities of the sports figures (so as to avoid a confound with previous knowledge of the specific facts).

Each comprehension test was comprised of three literal and three inferential multiple choice questions, and three literal and three inferential fill-in-the-blank questions, making a total of 12 items.

Procedure

Following a group session during which baseball knowledge and declarative metamemory knowledge were tested, those children who qualified as baseball experts (who scored 12 or higher on the test of baseball knowledge) were retained in the study and placed into one of four groups: training condition, baseball stories; training condition, nonbaseball stories; control condition, read/free recall only, baseball stories; and control condition, read/free recall only, nonbaseball stories. The boys were pretested using one baseball and one nonbaseball story, given two days of strategy instruction and practice, posttested 1-3 days after training, then again 2 weeks later. At testing the children were encouraged to ask out loud any question that came to their mind while they were reading silently. The number and type of "why" questions asked during reading and subsequent free recall were recorded on audio tape and in writing. The number and type of "why" questions, along with free recall were recorded and rated, and a comprehension test given after free recall.

RESULTS

Variables Impacting Strategy Acquisition

Since strategy use approached floor effects at pretest and for control (untrained) subjects, strategy use was measured for only the trained groups at the two posttests. Mean strategy use is reported in Table 1.

Group membership. Baseball experts trained in strategy use with baseball stories (T-BB) asked more "why" questions than did baseball experts trained in an unfamiliar domain (T-NB; see Figure 1).

Metamemory. Children with higher declarative metamemory scores asked more "why" questions than did children with lower scores (see Figure 2).

Domain. Subjects asked more "why" questions when reading nonbaseball than baseball stories.

The domain difference reached significance at the near but not the far posttest.

Higher but not lower metamemory children showed the domain difference (nonbaseball > baseball).

Although the group x domain interaction did not reach significance ($p < .18$), post hoc comparisons of the means involved indicated that the domain difference was found for children in the T-BB but not the T-NB group (see Figure 3).

Variables Impacting Memory of Text

Free recall was measured by asking children to state everything they could remember about the story immediately after reading. Cued recall and inferences were measured by the multiple choice and fill-in-the-blank items on the comprehension test, which was composed of 6 literal and 6 inferential items. Mean recall is reported in Table 2.

The main effect of group (T-BB, T-NB, and Control) on both free and cued recall did not reach significance. Free recall was not affected by prior declarative metamemory.

Higher but not lower metamemory children recalled significantly more literal items at both posttests than at pretest. No significant difference was found for inferential items.

Domain. The domain of the test stories impacted free and cued recall, with more facts recalled from baseball than from nonbaseball stories.

Variables Impacting Procedural Metamemory (Monitoring)

Immediately after completing the comprehension test, the children were asked to indicate how many of the 12 cued-recall questions they thought they had answered correctly. A positive accuracy score indicated over-estimation, a negative score indicated under-estimation, and zero represented accurate estimation. This measure of accuracy was interpreted as an indirect measure of monitoring (a component of procedural metamemory) of memory performance.

Group membership. The T-NB group was more accurate than the control group, while the difference between the T-BB and control groups approached significance (see Figure 4).

Domain. Children were more accurate about their memory for baseball than nonbaseball stories (see Figure 4).

Metamemory. Children with greater declarative metamemory knowledge tended to demonstrate more accurate procedural metamemory, the difference did not reach significance, $F = 2.12$, $p < .16$.

The Relationship Between Strategy Use and Recall

Given that strategies are effortful, capacity consuming processes, they are expected to provide a benefit in terms of improved memory in return for the effort expended. In order to examine the relationship between strategy use and recall in this experiment, correlations between the number of why questions asked and free recall were run (see Table 3).

The children trained with baseball stories did appear to benefit, in terms of the number of facts freely recalled, from asking "why" questions at both posttests, as is indicated by the significant correlations. T-NB children, on the other hand, did not benefit until the distant posttest.

CONCLUSIONS

1. The predicted effect of knowledge base was found for strategy acquisition, with children who were trained using stories within their area of expertise (T-BB) demonstrating greater strategy acquisition (operationalized as the number of "why" questions asked) than either children who were trained using stories outside of their area of expertise (T-NB), or control children who were not taught the strategy.

2. Higher-metamemory children were better able to acquire, maintain, and benefit (at least for cued literal items) from a new strategy than were children with lower metamemory, demonstrating a link between knowledge about one's memory processes and strategy acquisition.

3. The surprising find was that the T-NB children asked more "why" questions when reading a nonbaseball story than they did when reading a baseball story. One possibility is that the children trained with baseball stories were monitoring their reading more closely, appropriately identifying the nonbaseball stories as more difficult, a possibility indicated by the findings that higher metamemory scores were associated with greater strategy use and recall, and by the finding that, overall, children were more accurate in their postdictions for baseball than for nonbaseball stories.

4. Pressley and his colleagues have demonstrated that asking "why" questions can improve comprehension for adults and children (Wood, Pressley, & Winne, 1990), a finding that was not clearly confirmed by the present study. On the one hand, group assignment (T-BB, T-NB, or Control) did not result in significant increases in either free or cued recall, possibly due to the difficulty of the task (an expository passage instead of single sentences) or the nature of the subjects (poor readers).

5. There was, however, a relationship in the rank ordering of strategy use and free recall among children in the T-BB group, as indicated by the significant correlations between the number of

"why" questions asked and free recall at the two posttests. The children in the T-BB group showed significant correlations at both posttests, whereas children in the T-NB group did not appear to benefit (in terms of memory improvement) until the distant posttest. This is reminiscent of Miller's utilization deficiency phase (see Bjorklund, Coyle, & Gaultney, 1992; Miller, 1990; Miller, Woodey-Ramsey, & Aloise, 1991), a phase during strategy acquisition in which strategy use is found in the absence of improvement in memory.

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Table 1

Mean Strategy Use

	T-BB	T-NB
Lower metamemory		
Immediate posttest	6.25	1.61
Delayed posttest	3.06	1.06
Baseball stories	4.50	1.33
Nonbaseball stories	4.81	1.33
Higher metamemory		
Immediate posttest	10.86	6.50
Delayed posttest	9.07	4.62
Baseball stories	9.14	5.12
Nonbaseball stories	10.79	6.00

Table 2

Mean Cued Recall

	T-BB	T-NB
Lower metamemory		
Pretest	2.47	2.46
Immediate Posttest	2.55	2.88
Delayed Posttest	2.52	2.64
Baseball Stories	2.96	2.99
Nonbaseball Stories	2.06	2.32
Literal Questions	3.08	3.15
Inferential Questions	1.94	2.17
Higher metamemory		
Pretest	2.54	2.75
Immediate Posttest	3.11	3.30
Delayed Posttest	2.61	3.22
Baseball Stories	3.25	3.62
Nonbaseball Stories	2.25	2.55
Literal Questions	3.29	3.38
Inferential Questions	2.21	2.80

Table 3

Correlations Between Strategy Use and Free Recall

	T-BB	T-NB
Immediate Posttest		
Baseball stories	.69**	.36
Nonbaseball stories	.55*	.11
Delayed Posttest		
Baseball Stories	.80**	.56*
Nonbaseball Stories	.64*	.65**

Note: ** $p < .01$
* $p < .05$

EXAMPLES OF MATERIAL USED

Pretest of baseball knowledge (from Recht & Leslie, 1988):

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When a play is called a passed ball, who has lost control of the ball?

a. the hitter
b. the catcher
c. the pitcher
d. the umpire

When a batter hits for the cycle, the batter:

a. hits in extra innings during the game
b. hits four times in one game
c. hits a single, double, triple and home run in one game
d. hits a home run each time he is at bat

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Index of Reading Awareness (Jacobs and Paris, 1987)

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If the teacher told you to read a story to remember the general meaning, what would you do?

___a. Skim through the story to find the main parts.
___b. Read all of the story and try to remember everything.
___c. Read the story and remember all of the words.

If you are reading for science or social studies, what would you do to remember the information?

___a. Ask yourself questions about the important ideas.
___b. Skip the parts you don't understand.
___c. Concentrate and try hard to remember.

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Figure 1

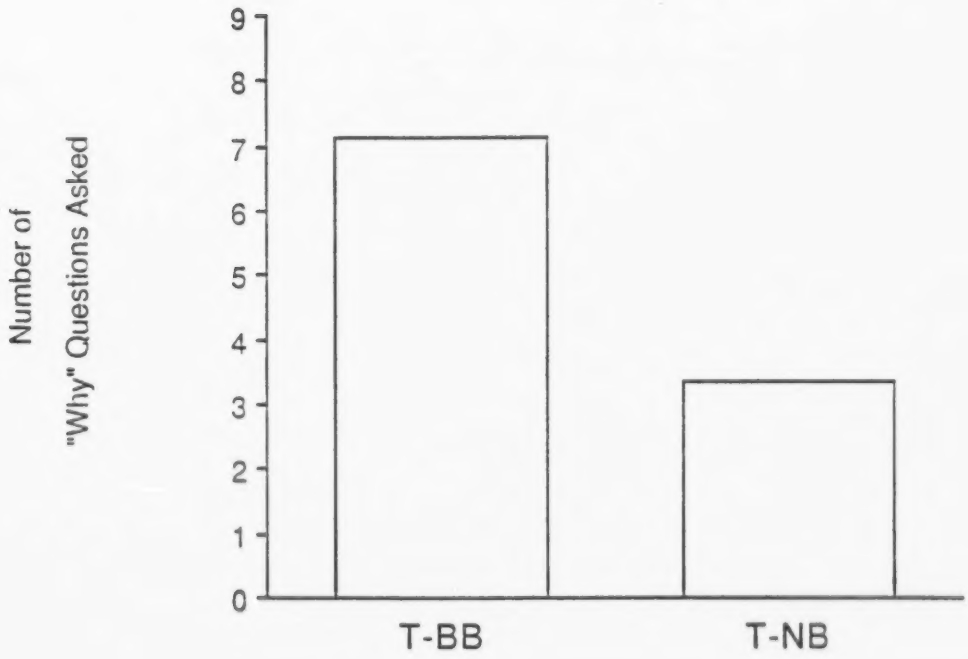


Figure 2

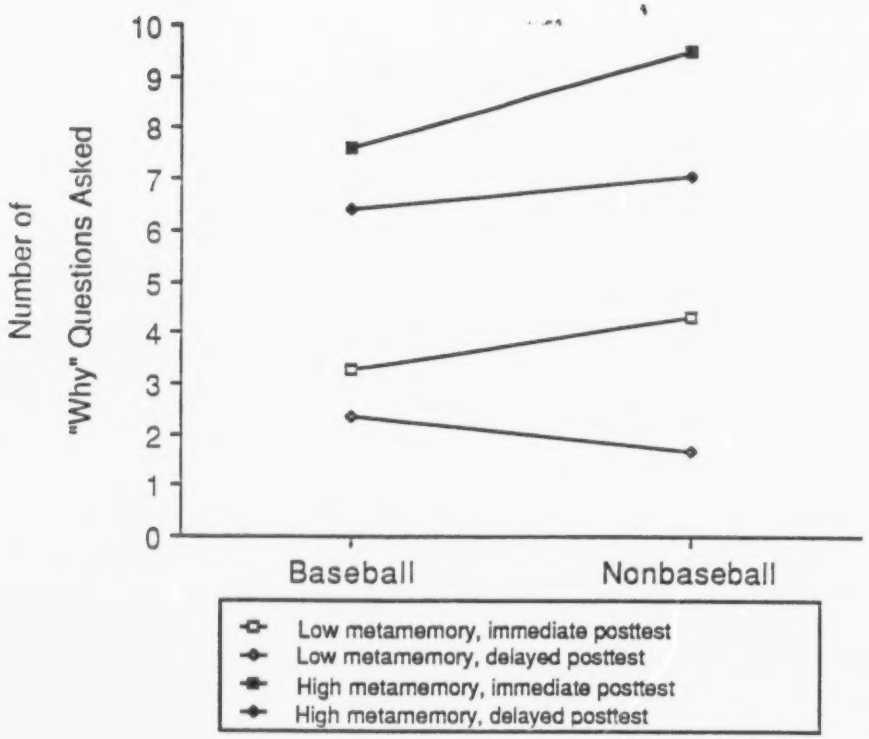

Number of "Why" Questions Asked
10
9
8
7
6
5
4
3
2
1
0
Baseball
Nonbaseball
Low metamemory, immediate posttest
Low metamemory, delayed posttest
High metamemory, immediate posttest
High metamemory, delayed posttest

Figure 3

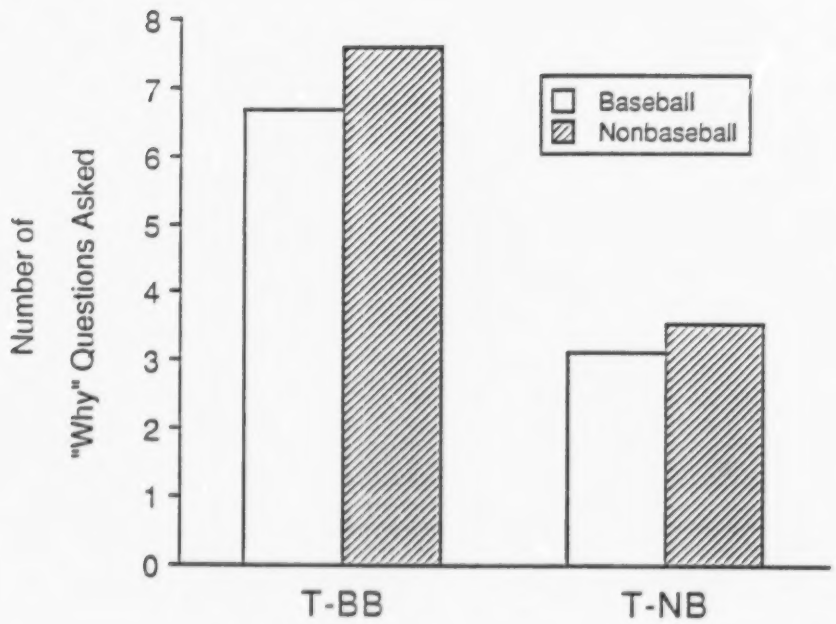
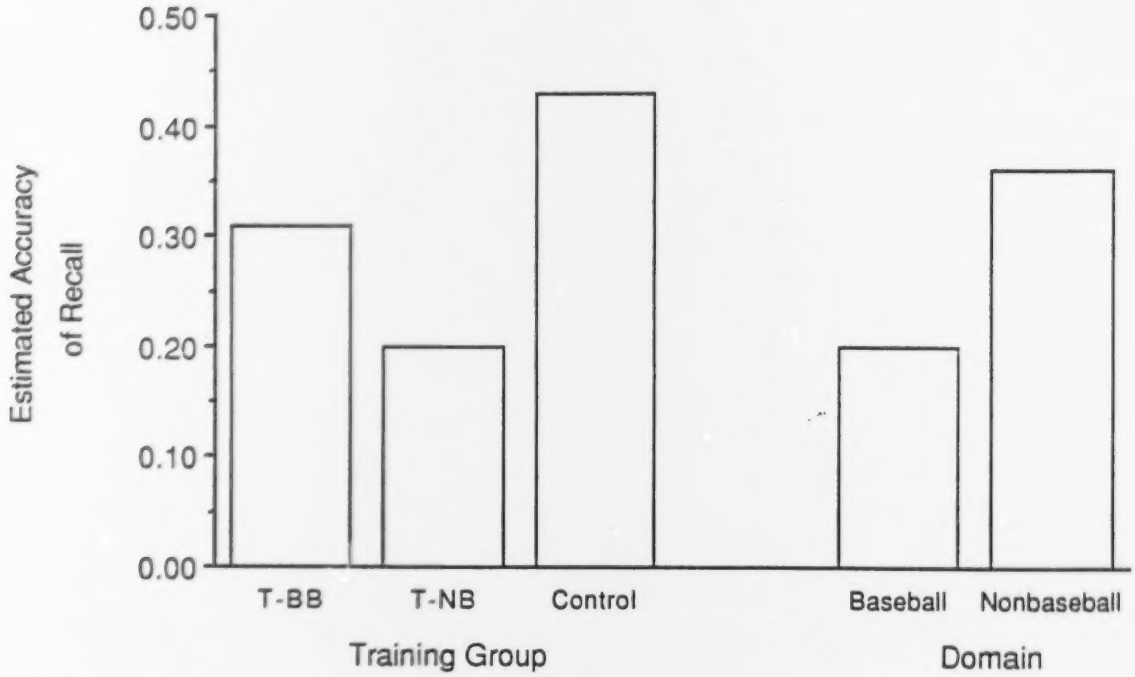

Number of
"Why" Questions Asked
8
7
6
5
4
3
2
1
0
Baseball
Nonbaseball
T-BB
T-NB

Figure 4


0.50
0.40
0.30
0.20
0.10
0.00
Estimated Accuracy of Recall
T-BB
T-NB
Control
Baseball
Nonbaseball
Training Group
Domain